WESTERN UPDATE #63

THE WESTERN NEWSLETTER FOR MF, LF, AND VLF EXPERIMENTERS

Available for business-size 25 cent SASE's, plus 60 cents per issue (or $7 per year)
from: Jim Ericson, 226 Charles St., Sunnyvale, CA 94086-6063

ACTIVE WESTERN BEACON STATUS (LIST COMPILED February 23, 1989)

FREQ(kHz)	IDENT	QTH	SKED INFO
163.80	FPV	Granada Hills, CA	Weekends. See alt. freq. 182.62 kHz.
163.88	M	San Diego CA	24h/7d.
164.89	T (dashes)	Sunnyvale, CA	24h/7d. A2 modulation (+/- 775 Hz).
166.503	C	near Morro Bay, CA	24h/7d.
167.25	AHN	Fallbrook, CA	24h/7d.
169.96	NRE	San Diego, CA	24h/7d
170.40	B	San Ysidro, CA	24h/7d
175.225	MAX	Wheatland, WY	24h/7d CW. BPSK/ASCII by request.
175.703	FAW	Orem, UT	24h/7d.
176.00	HDOMBAY	Morro Bay	24h/7d.
176.75	SR	Elgin, OR	24h/7d.
176.85	7FS	Belfair, WA	24h/7d.
179.0	MPM	Salt Lake City, UT	24h/7d. ASCII/CW alternating 5minutes.
179.54	WJ	Arleta, CA	Intermittent.
180.224	F	Los Banos, CA	FSK. By request.
180.80	XU	Sioux Falls, SD	24h/7d. BPSK/CW alternating 5 minutes.
181.17	IZJ	San Gabriel, CA	Daily. Silent 0700 to 1100 UTC.
181.287	MEL	San Jose, CA	24h/7d.
181.682	1SUN	Durant, OK	8-10am, 8pm to midnite CST, 7 days.
182.62	FPV	Granada Hills, CA	Weekends See alt. freq. 163.80 kHz.
182.672	G	Palo Alto, CA	24h/7d.
182.88	H	Descanso, CA	24h/7d.
183.160	PRK	Saratoga, CA	24h/7d.
183.63	PLI	New QTH Burbank, CA	On beginning about March 1st.
184.016	EK	Sunnyvale, CA	Intermittent. Also testing on 184.26 kHz.
184.32	N3S	Mocksville, NC	Intermittent tests.
184.39	HO	Pahoa, HI	By request.
184.43	V	Forestville, CA	24h/7d.
184.46	B	Fresno, CA	24h/7d. New Beacon (Boyd Skillin)!
184.80	T (dashes)	Mountain View, CA	24h/7d.
185.0	ZYK	Redway, CA	24h/7d.
185.00	AU	Champaign, IL	0100 to 0600 UTC, 7 days.
185.49	AZ	Tucson, AZ	24h/7d.
186.80	BA	Lancaster, IL	24h/7d.
187.0	ELU	Simi Valley, CA	24h Saturday and Sunday on SSB.
187.252	TEXAS	NW of Ft. Worth, TX	24h/7d.
187.30	UPN	Cincinatti, OH	Occasional.
187.50	DCH	Berlin, MD	24h/7d.
187.50	J	Los Angeles, CA	24h/7d
187.59	SM	San Jose, CA	24h/7d.
189.84	R	Nevada Test Site	24h/7d.
190.4	OHH	Richmond Hill, Canada	Occasional testing.
530.+/-.76	T (dashes)	Sunnyvale, CA (WA6AJY),	A2 mod 24h/7d. Ed Gelinas. Simulcast with T at 164.89
1624.75	CT	Pleasant Gap, PA	24h/7d. New Beacon (Clint Turner)!
1637.45	SS	San Rafael, CA	24h/7d. Steve McGreevey. Note QSY.
1655.5	CO	Glenwood Springs, CO	24h/7d. New Beacon (Bob Cutter)!
1658.08	Z2	9 mi. NW San Simeon, CA	Intermittent. New Beacon (Mike Mideke)!
1687.28	D	Descanso, CA	6PM to 6AM daily (Frank Cathell).

MORE SASE'S ON FILE

Non-Western listings are beacons currently being copied in the West, or they have SASE's on file with us.

ZEBRA NEWS for WU*63: By Mike Mideke, PO Box 123, San Simeon, CA 93452. Though I'd long been dubious about the skywave potential of Part 15 transmissions above 510 kHz, repeated reception of **Steve McGreevy** and **Frank Cathell's** Upper MedFER beacons finally convinced me to give a serious try at transmitting a signal. The first step was to build a self-contained beacon transmitter. This utilized CMOS osc/divider/ID'er stages and a VN7000 final amplifier. An LM 317 adjustable regulator was included to provide precise control of supply voltage to the final.

The second step was to build an antenna. This developed into a welded structure with a 6 element 30" radius skirted tophat atop a short section of lightweight 1-1/2" TV mast (see photo).

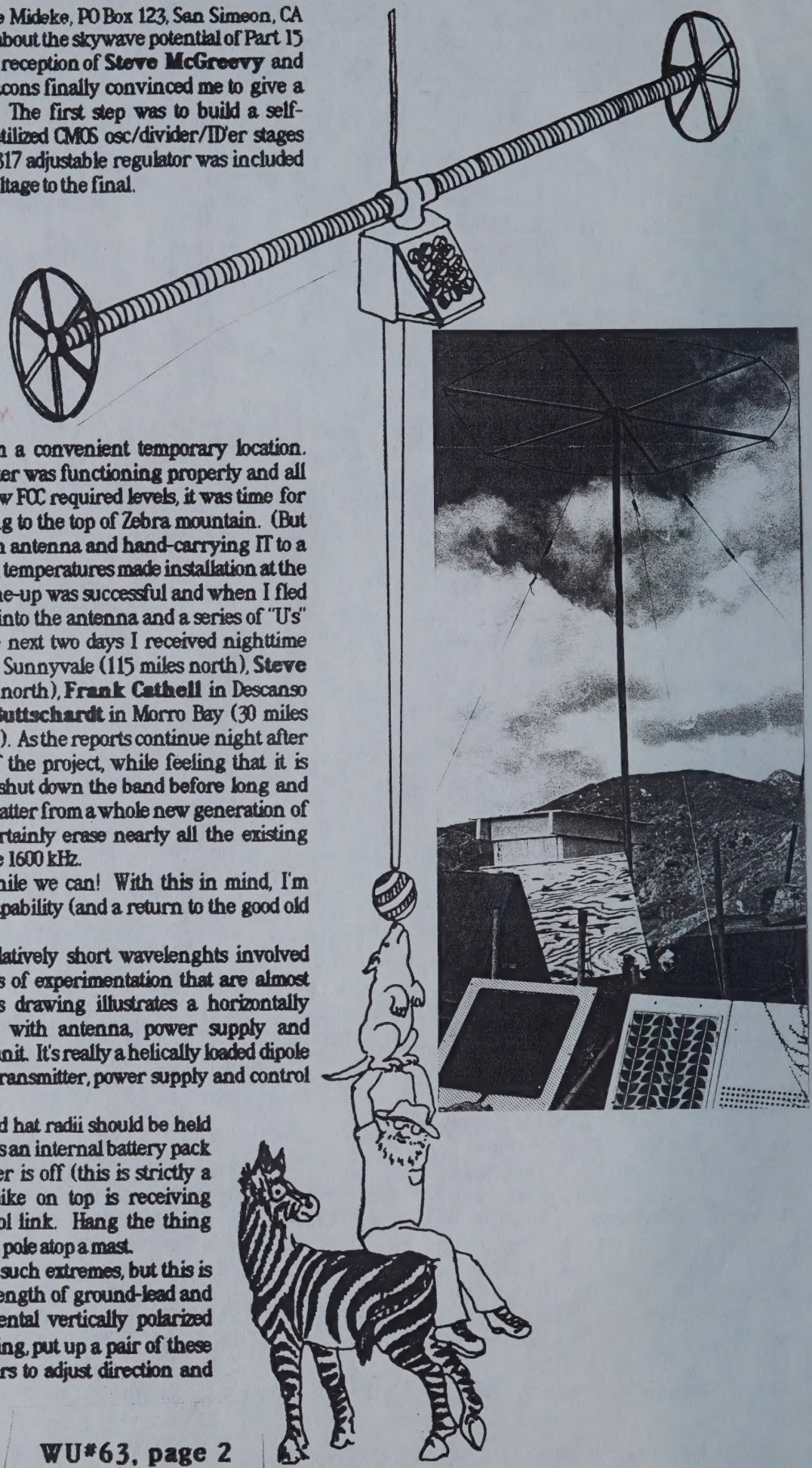
After improvising a loading coil by series connecting a pair of loading coils from MF marine rigs, the complete system was tested from a convenient temporary location. Once I was satisfied that the transmitter was functioning properly and all harmonics were attenuated well below FCC required levels, it was time for the big step of hauling the whole thing to the top of Zebra mountain. (But imagine building a comparable 1750m antenna and hand-carrying IT to a remote site!) High winds and freezing temperatures made installation at the Z2 site a most unpleasant task. But tune-up was successful and when I fled the ridgetop, 50 mA of RF was going into the antenna and a series of "U's" was emitted on 1658.08 kHz. Over the next two days I received nighttime signal reports from **Jim Ericson** in Sunnyvale (115 miles north), **Steve McGreevy** in San Rafael (160 miles north), **Frank Cathell** in Descanso (nearly 300 miles south), and **Cliff Buttschardt** in Morro Bay (30 miles south, and nearly too close to hear me!). As the reports continue night after night, I'm gratified at the success of the project, while feeling that it is really TOO easy. Still, QRN will likely shut down the band before long and the impact of multi-layered fading splatter from a whole new generation of AM broadcast stations will almost certainly erase nearly all the existing skywave potential of the region above 1600 kHz.

So we had better enjoy the band while we can! With this in mind, I'm moving toward a communications capability (and a return to the good old Z2 ident).

The small antennas and relatively short wavelenghts involved here would appear to facilitate types of experimentation that are almost totally impractical on 1750m. Elea's drawing illustrates a horizontally polarized Part 15 radiating system, with antenna, power supply and transmitter incorporated in a single unit. It's really a helically loaded dipole with capacitive hats on the ends and transmitter, power supply and control unit mounted in the center.

Overall length of helix plus combined hat radii should be held to 117 inches. The solar panel charges an internal battery pack during the day when the transmitter is off (this is strictly a skywave generator). The little spike on top is receiving antenna for 49 MHz or other control link. Hang the thing between trees or put it on a fiberglass pole atop a mast.

In practice there is no need to go to such extremes, but this is one way to eliminate concern with length of ground-lead and to do away with at least <u>most</u> incidental vertically polarized radiation. To reduce the effects of fading, put up a pair of these with different orientation. Use rotors to adjust direction and azimuth. Why not?



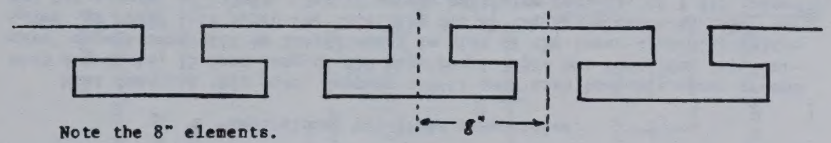
73 - mike

A Different Kind of Antenna
or
The capacitance of wire "TOP HATS"

by Herb Vanderbeek, WI6G

In the never ending quest for a better antenna, receiving or transmitting, one must go for the known and the unknown. Last summer I picked up a book, a "compendium" on antennas. An article billed as "A HIGH CAPACITY ANTENNA FOR VERTICAL HEIGHTS LESS THAN 1/4 WAVELENGTH" By John L. Reinartz, K6BJ, caught my attention. See (1). I thought, "Now there's an idea for a better LowFER antenna!". I will call this the Reinartz Radiator, or "RR".

I studied the arrangement to understand just what was being presented. The antenna is referred to in later articles of the compendium as an inductor. How can this be when we "know" that an antenna shorter than a quarter wavelength is capacitive in nature. In one sense it is an inductor because it is part of an unterminated transmission line, the antenna. The several articles discribe many ways of "winding" the antenna. One of them: stuff the wire into a straw, and prune, for 144mHz use! From the published Reinartz article: "Starting from the top of any vertical support, such as a bamboo fishing pole or glass rod of any desirable height, an enamel covered copper wire of #16, 14, or 12 B&S gauge is started at the top after fastening with rubber tape. Then at the 8" point the wire is turned back up for 4" then down for 12", again turned up for 4", again turned down for 12", etc. to the bottom of the supporting pole. As the wire is first turned up and then down, it is displaced 120 degrees from the other wire so that the three wires are spaced equidistant around the supporting pole." Example below:



Note the 8" elements.

At any one time over the 4" fold back there are three wires in parallel carrying the antenna current. The net result is that at least two of the 4 inch "radiated" fields are cancelled while the wire resistance is still in effect. I don't believe that this is a variation of a folded dipole. One of the apparent advantages claimed for the RR's use in mobile service on the H.F. bands is that it presents a higher resistance to the generator, transmitter, antenna tuner, etc. It should, it has two times the wire resistance of a straight wire radiator. Of course it also has higher capacitance.

In LowFER work we see a similar condition,. The series loading coil resistance contributes 10 to 30 ohms to the resistance that is to be driven by the transmitter. While the inductor makes it possible to deliver more energy to the antenna system it wastes about 50% of the transmitter energy.

My LF experiments consisted of whether the RR is useful as a "top hat" capacitance and also a determination of the signal radiated by a straight radiator and the RR. The radiation tests of the vertical were done with a 25 foot mast compared to a 25 foot wire, and a 25 foot RR. These antenna tests are reported in a separate article.

As a top hat capacitance the RR is better than a straight piece of wire. This is not because it is "wound" in the above manner but rather that the volume occupied by the winding process increases the effective capacitance by a predictable amount. Exactly the same amount of wire spaced to exactly the same "outside dimensions" (about 1") but simply three wires in parallel produced a little more capacitance, at least within my ability to differentiate between +/-1pFd out of 60pFd. Two wires spaced to the same outside dimension produced almost the same effective capacitance.

From the above I recommend the use of multi-wire radial capacitance wires because there is more capacity for an equal number of radials. Thus if my location allows only four radials and if I can effect 50% more capacitance than with single wire radials alone then this allows me to reduce my inductance by 50% using no more insulators or support cord. Just a little more copper wire of which I have too much. In fact, some of that extra wire can come from the coil itself! A distinct advantage to the technique is that the added capacity does not include the added shunt loss of more insulators. The relationship of the wires must be stablized with spreaders every few feet to reduce the variation of capacitance as the wind whips the radials. Wooden dowels are fine since there is no voltage difference between wires.

Tests suggested by the above finding produced the following results for horizontal "wires" 17 feet long supported 4.5 feet above very damp ground. With ends grounded, a forty foot insulated #0 copper 7 strand wire lay parallel along the ground. The test system ground was to the center of the #0 wire. The insulators were white PVC schedual 40 pipe 24 inches long. A number of tests and results of the capacitance for various wire configurations are listed below.

Test #	# of Wires	Comments	Wire, pFd/Foot
7	1	#19	1.88
1	1	#19	2.00
6	1	#19	2.00
17	1	#19	2.00
9	2	2x#19 in contact	2.22
18	1	3/16 dia braid	2.43
11	3	3x#19 in contact	2.64
8	1	3/16 dia braid	2.54
5	3	3x#19 in contact	2.64
2	2	2x#19 spaced 3"	2.88
3	2	2x#19 spaced 6"	2.90
19	1	RG/8U Coax	2.97
13	2	2x#19 spaced 5"	3.30
4	3	3x#19 spaced 3"+3"	3.55
16	2	2x#19 spaced 15"	3.58
10	2	2x#19 spaced 15"	3.59
14	2	2x#19 spaced 15"	3.64
16	1	2"dia drain pipe	4.00
15	3	2#19&1xbraid 7.5"+7.5" (braid center)	4.63

TABLE 1

To understand and verify my measurements I researched several engineering texts for appropriate formulas. The algorythms are not difficult except for the repetitive nature of the calculations. For these experiments several formulas from Terman's Engineering, (See 2), were encoded with BASIC (CP/M) and a series of calculations run for single and multiple wires. There is one formula for single wires and another for multiple wires. In the multiple wire case there appears to be an error condition that is not accounted for by the authors separate limit equation. But then who is going to use wires from 2" to 12" in diameter. High count wire cages! These calculations do not account for increased capacitance due to end effects.

Capacitance of Single Wires (Computed 4.5ft above gnd):

Calc #	Wire Size	Comments	pFd/Foot	% of measured	
1	.01"	#30	1.69		
2	.036	#19	1.97	-1.5	TABLE 2
3	.10	#10	2.21	See	
4	.188	3/16 Braid	2.40	-3.5 Table 1	
5	1.0	Pipe*	3.15	above	
6	2.0	Pipe*	3.62	-10	

Capacitance of Single Wires (Computed 38ft above gnd)

Calc #	Wire Size	Comments	pFd/foot	
1	.01	#30	1.40	
2	.036	#19	1.58	TABLE 3
3	.10	#10	1.73	
4	.188	3/16 Braid	1.84	
5	1.0	Pipe*	2.26	
6	2.0	Pipe*	2.48	

Capacitance for Three Wires (Computed 38ft above gnd & 7.5"+7.5"spacing)

Calc.#	Wire Size	Comments	pFd/Foot	15 ft length	
1	.01"	#30	3.24	48.9pFd	
2	.036	#19	3.56	53.4	TABLE 4
3	.1	#10	3.8	57.0	
4	.188	3/16 Braid	4.0	60	
5	1.0	Pipe*	4.59	68.9	
6	2.0	Pipe*	4.9	73.5	

*Rediculous, but gives perspective.

What does all this mean. Suppose a 34ft pole with base 8ft above ground with 4 radials, 15 feet long of #10 wire for 1.73pFd per foot. Our "approximate" capacitance will be 104pFd added to that of the tower typically calculated at 70pFd less 30pFd for shielding due to the droop angle of the top hat for a total of 143pFd. But if we use multiwire radials, of 3 #10 spaced at 7.5", we should be able to effect 228pFd of top hat capacitance added to that of the tower for a total of 268pFd, a 83% total increase and an inductance decrease of 83%. A meaningful saving in coil losses, and no increase in insulator losses.

One of the effects noticed while browsing through the calculations is that the rate of capacity increase decreases as the wires come closer to each other. This has been reported by other experimenters. Thus more radials will result in more capacity up to the limit of a solid disc. The limit of capacitance for a solid surface thin disc 30ft in diameter is 324pFd. If you "fatten" a disc to become a solid surface sphere the capacity only increases by 54%. The wire configurations discussed above will in fact show less capacity than estimated. Never-the-less the capacity increase will be well above 50% for the indicated construction. Well worth the effort.

(1) 40 YEARS OF MOBILEERING, ANTENNAS, INSTALLATIONS, TUNERS, A COMPENDIUM, W6AAQ, 1988 (ref call book)

(2) RADIO ENGINEERS HANDBOOK, TERMAN, 1943

MEDFER NOTES for 2/9/89: Steve McGreevy, 45 Elda DR., San Rafael, CA 94903

Early this morning (2/9) Mike Mideke's MedFER beacon U on 1658.09 KHz was copied for the first time here at 0830z. By 0945z, U was peaking QRK 3-4 for 5-10 second time spans and fair QSO copy at 6-9 dB above weak powerline noise (using 90Hz audio b.w.). My initial reception was during a casual "Top-End" band scan looking for those odd letter number beacons which occupy the frequencies adjacant to D, U, and SS. My audio filter was switched out and the bandpass was 2.7 Khz! I was using my "HF wire", a 100 foot long end fed wire up 25 feet over a counterpoise system--no fancy long-wires here. Had I been using a long-wire (Beverage) at Point Reyes, I'm sure U would've been "arm-chair" quality (read: loud!). U is about 160 miles SSE of San Rafael. Mike is running his 100 mW U beacon from the old Z2 site atop a ridge into a 2 meter high top-hatted antenna and using the extensive ground radial/rod system which gave Z2 its notoriety.

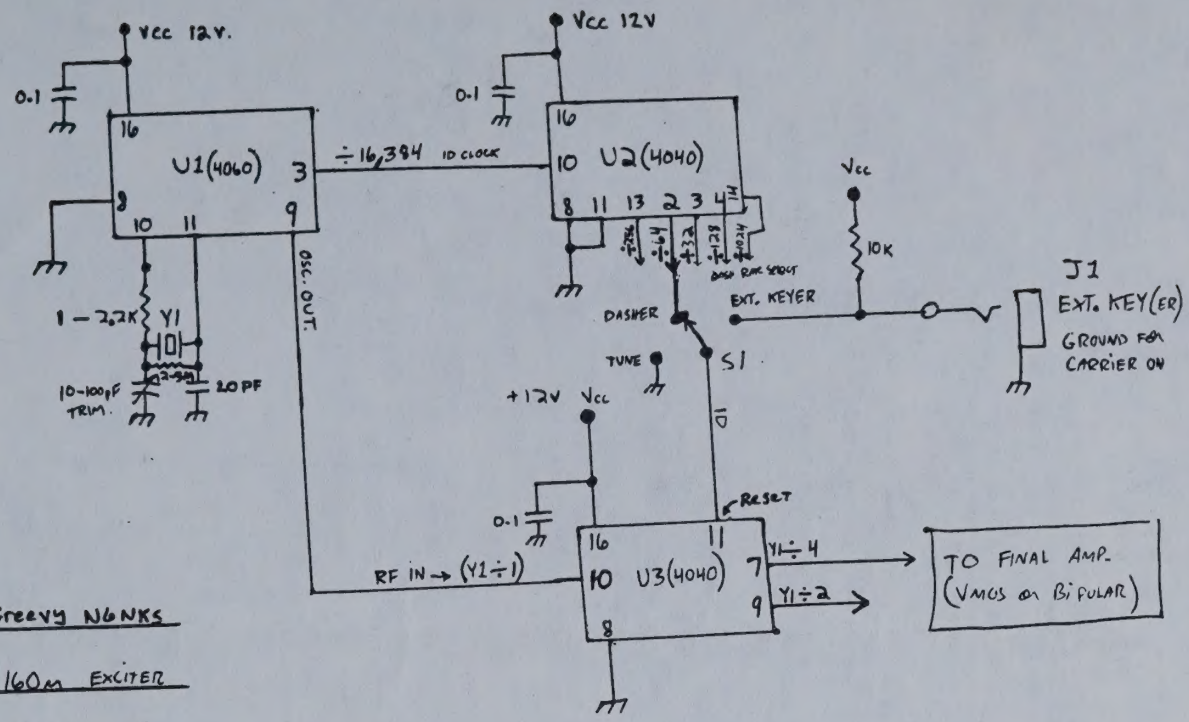
Some important notes should be made regarding my MedFER xmtr on page 6 of WU #62. Per Mitch Lee, a 74HC04 will work better than the 'HC14 and the chip will oscillate xtals more linearily. Connect a 6-volt Zener diode from pin 14 of 74HC14 to ground to limit its supply voltage to less than 6V. A Caveat: the 5K resistor from the base of the 2N2222 final amp to ground was fine for the relatively low drive level fron the 4013, BUT, I fried two 2N2222's finals in my latest MedFER beacon circuit which uses a 4060 to a 4040 in divide-by-2 fashion--(the drive output from pin 9 of the 4040 is quite large) before I determined that 45 to 55 OHMS should be the maximum value for the base-ground resistor--any higher value over-drives the 2N2222 leading to thermal-breakdown and destruction.

Regarding a 4060, it gets "cranky" oscillating xtals above about 6.5 MHz though some 4060's have worked happily past 8.3 MHz. Ditto with the clock input to a 4040. That is why I prefer div.-by-2 so I can use my 80 meter ham band xtals for 160 Meters. The 4060/4040 div.-by-2 circuit seems very stable and glitch-free unlike the 74HC14/4013 MedFER beacon exciter which can have wierd "kinks" in its operation, though my "SS-dash" MedFER beacon uses the 74HC14/4013 circuit as presented in WU #62 and performs very reliably.

Frequency drift in MedFER beacons will result from temperature changes in the xtal oscillator environment as well as supply voltage fluctuatiuons to the circuit--the latter should be minimized in a good power supply. My "SS-dash" beacon drifts between 1685.158 and 1685.163 over a one day period due to temperature changes in the room where I run it, and I feel that is acceptable for most narrow-band listening. More than 10-15 Hz drift over a 24 hour period means something is wrong although old surplus xtals long unused and now brought back into service in our rigs may have some initial drift before they settle into a more-or-less stable frequency. Of course, if the beacon is outside and experiences wide temperature swings ranging from overnight sub-freezing to daytime hot-sunlight shining on the xmtr enclosure, that is a good excuse for frequency drift as much as 50 Hz in a div.-by-4 circuit!

I wish to submit my latest "Simple MedFER Beacon" circuit which I know to be better and less "glitchy" than my other circuit in WU #62. The final amp. can be of your choosing but I'm reproducing the bipolar p.a. which is compatible with the 4060/4040 exciter. The nice thing about this circuit is the incorporation of a second 4040 (U2) to further divide down Y1's frequency to a speed slow enough for a "dasher" ID. Additionally, the dash rate can be determined from Y1's frequency. Another suggestion could be to use U2's output to clock a more complex identifier circuit--ID "cycle-length" would be known to a high precision once Y1's frequency is determined. Good DX listeners like to know a beacon's ID cycle-length at the very least to "prime" their ear/brain system for a particular "rhythm" to listen for.

I would like to plead here for more MF beacon operations in the Western U.S. as I only have two signals to listen for (besides my own): D and U. My own hope is for the number of MF beacons to approach what exists on 1750 Meters--what DX joy that would be for me and others-hi! 73 de SS



Steve McGreevy N6NKS

"MEDFER" 160m EXCITER

For 1600–1900 KHz:

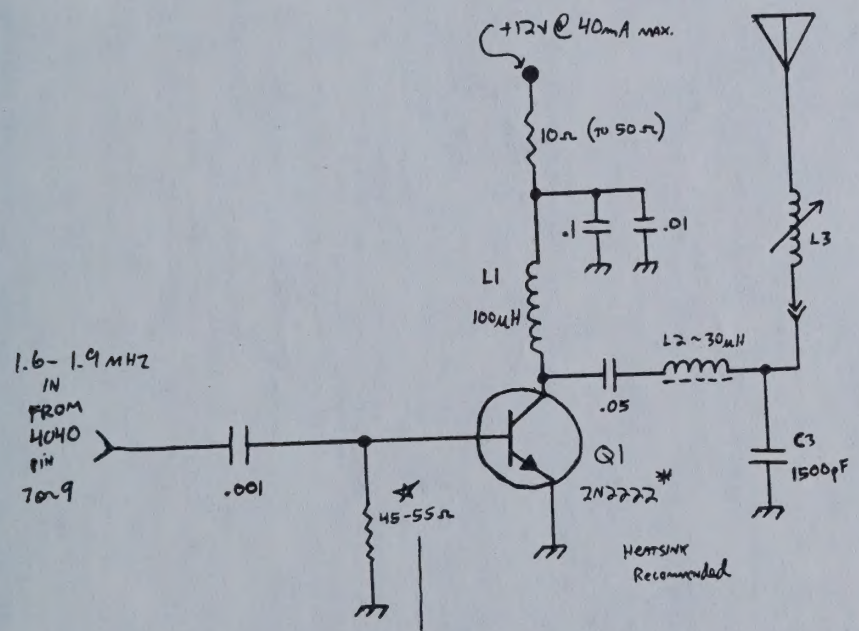
$Y1/4$ = 6400 – 7600 KHz

$Y1/2$ = 3200 – 3800 KHz

DASH RATE PER MINUTE:

freq. Y1 (in KHz) ÷ 16.384 ÷ n × 60 = DASHES/MIN. (10 CLOCK RATE)

n = U2 ÷ BY SELECTION (PINS 2,3,4,13,14 etc)



(L2+C3 = HARMONIC FILTER
2nd HAR. < 20 dB DOWN
3rd etc. < 25 dB DOWN)

AVG. EFFICIENCY: 60 TO 70%

* NOT > 55Ω or EXCESSIVE DRIVE TO Q1 WILL RESULT IN EXCESSIVE CURRENT CONSUMPTION & THERMAL RUNAWAY

BIPOLAR FINAL for 4060/4040 EXCITER

1.6–1.9 MHZ 190-160meter FINAL

Tested 2/8/89 Steve McGreevy

EK NOTES: A combination of shifting interests and worse-than-normal conditions have resulted in rather "ho-hum" LF activity recently. My own **EK** beacon has been off recently due to my chart recording experiments with **Mike Mideke**. The "V" beacon (located in Forestville, CA, near the Russian River) was being heard reasonably well toward the end of last year, and recently seemed to disappear. **Herb Vanderbeek** and I drove to the site 90 miles north of Sunnyvale on February 22nd and found the beacon still on, but the vertical antenna lead had snagged in a nearby tree due to local winds. We did a bit of tree pruning, so V ought to be back in business. This is a good "weak" one to listen for. It's on 24h/7d, but the antenna is marginal.

Medium Frequency (MedFER) activity continues to increase, and some recent results are quite amazing! The new **CO** beacon in Colorado is being heard well in California. The **Mideke new Z2 MedFER beacon** is routinely heard around California, and was even copied fine by **Rex Wilson** in Arizona and by **Bob Prell** in Oregon! It's sure nice to hear the old **Z2** identifier back on the air!

RESOURCES: **Herb Balfour** of Canada continues to do a superb job of publishing the east coast LowFER/MedFER newsletter **THE NORTHERN OBSERVER**. Write to Herb at his address listed in this issue. Since it is mailed from Canada, Herb's deal is $12 US per year, plus 12 business-size self addressed envelopes. He will affix Canadian postage. By the way, Herb plans an informal visit with several California LowFERS toward the end of February, so we may have a few mini-convention tidbits to report next issue! For those interested in alternative energy (photovoltaic, wind, water, etc.) there is a bimonthly magazine available FREE titled **HOME POWER**! It's thoughtfully and creatively written, and offers a wealth of hands-on information. Request a subscription by writing to **HOME POWER MAGAZINE**, POB 130, Hornbrook, CA 96044-0130. Telephone (916) 475-3179. Non-directional beacon (NDB) listeners shouldn't be without a subscription to **Sheldon Remington's NDB DX NEWSLETTER**. The newsletter is now being published and distributed by **Chris Catotti**, 1606 South Dover Road, Dover, FL 33527-9387. Reproduction cost plus mailing runs $1.40 per issue. Note that Sheldon is still the editor, and material for publication should be sent directly to him. The basic publication covering low and medium frequency experimentation/listening is **THE LOWDOWN**, put out by the Longwave Club of America, 45 Wildflower Road, Levittown, PA 19057. A one year subscription is $12.

MAILBAG: **Brice Anderson** of Illinois reports, "Conditions on LF have been generally poor. Beacons within about 450 miles have been good -- best in daytime -- but there have been only a few openings out farther." Brice pointed out that the January attempt at a transcontinental LowFER relay (reported in WU #62) was actually organized by **Bill Diggins**, WA8LXJ. It's too bad the attempt coincided with a geomagnetic storm!

Rex Wilson KB7TI of Kingman, AZ is copying the new Z2 MedFER beacon, and also the **Frank Cathell D MedFER beacon** near San Diego. He was using an 80 foot wire with a Uniden 2101 receiver. Rex is busy building a LowFER beacon.

Boyd Skillin got his new 184.46 kHz beacon going February 7th. Good signals into the San Francisco area! The transmitter is a **Mitchell Lee** IRF-511 design into a 30 foot vertical with a 10 x 10 foot chicken wire ground plane. Boyd thanks those LowFERS who helped and supported him!

Clint Turner has moved to Pennsylvania and reports, "I will attempt to put up a LF beacon here, but it will be at least a few weeks before I can even think about putting it up. I have set up an experimental MF beacon, however. It signs **CT** and is on 1624.75 kHz. At the moment this beacon is running 100 mW into a slant wire." During his drive across the country, Clint listened for LowFERS frequently, but was disappointed to hear only **FAW** in Utah. **MAX** was apparently off the air. Clint asks that we make known the fact that he is looking for any LowFER-related computer programs (antennas, logging, etc.). He can handle 5-1/4 inch IBM, 5-1/4 inch CP/M, and 8 inch SSSD CP/M. Clint also made the observation that sometimes we will list a "new beacon" on the front page of **Western Update**, yet no mention of it is made in the text. The reason for this is that several new beacons have appeared in the past months, but the owners do not opt to communicate with **WU** (by the way, if I have an address, I ALWAYS send at least one courtesy copy to anyone with a new beacon). Again, I can only print what arrives in my mailbox!

Wally Jones of Arleta, CA notes that his **WJ** beacon is on the air, but intermittent. He sent along a photocopy of an excellent article on ground systems/ground resistance which he offers to supply to interested LowFERS in exchange for a SASE.

Greg Raven of Texas checked in to say, "...no changes to the **TEXAS** beacon, except that you may want to add the grid locator EM12."

Ken Cornell of New Jersey is busy completing a manuscript for the new 6th edition of his fine **LOW AND MEDIUM FREQUENCY SCRAPBOOK**. This should be ready by midyear, and Ken will inform us of price and availability. Ken adds, "If any of the LowFER group feel that they may have something that they would like to see published in the scrapbook, have them get in touch with me." (Ken's address is at the back of this issue).

Dean Manley writes from Hawaii that he is sharing info with **KH6CC** and **KH6JRM**, as both are interested in LF-MF beacons. Dean is presently running a 24h/7d one watt signal into a full wave horizontal loop on 1809.5 kHz signing "KH6B/B".

Bob Costa of Redwood Estates, CA in interested in working with other Bay Area LowFERS to develop a PACKET/AMTOR network. Bob plans to have a 1750m beacon on the air soon. Bob is assistant EC for Los Gatos/Santa Cruz Mountains, and Vice President of the Ford Aerospace Amateur Radio Club.

John Seamons (JKS) writes that he has been terribly busy at work, and has temporarily shut down his beacon until he finds time to troubleshoot some interference problems.

Bob Cutter (CO) has moved **CO** to 1653.5 kHz, and reports, "I will probably put 176.26 kHz back up come spring. I have copied **AZ** and **MAX** so far this winter."

Cliff Buttschardt (C) of Morro Bay, CA has kindly been supplying NE602 IC chips to experimenters wishing to build the simple LF converter circuit designed by Frank Cathell (see **WU #59**). Cliff is doing this on a non-profit basis. Send him $6 and he will mail two NE602 chips! (Ed. Note. I think Cliff is losing money on this deal. Why not send him $7?).

MORE ON PROPAGATION MONITORING USING A RUSTRAK SAMPLING CHART RECORDER

by: Jim Ericson

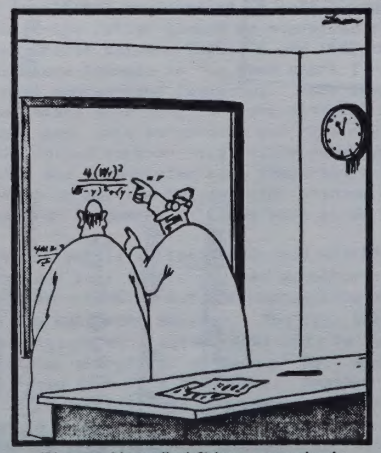
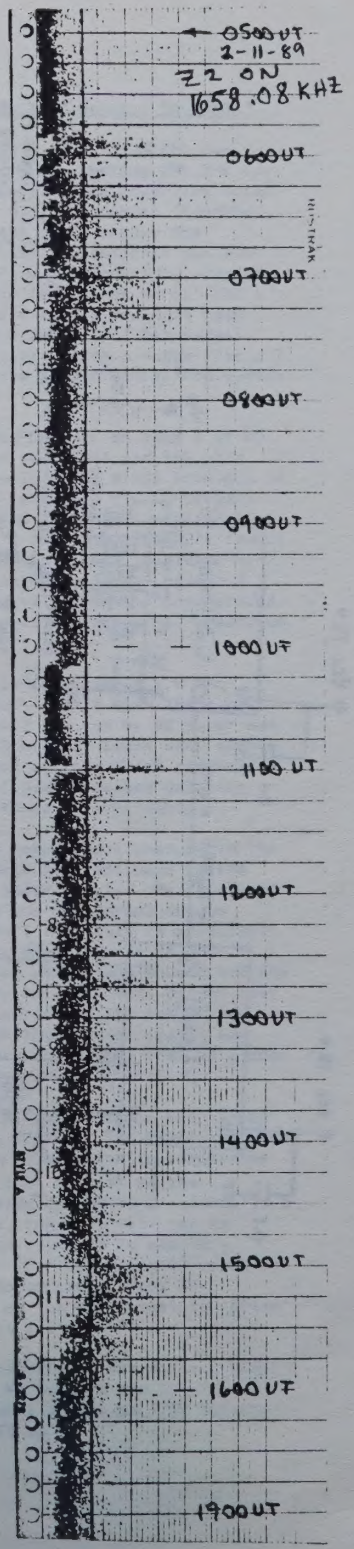
As reported in **WU#62**, we've been experimenting with a Rustrak Model 88 chart recorder in the past months. When **Mike Mideke's new Z2** beacon appeared on the MedFER band (1658.08 kHz) we took the opportunity to attempt a chart recording of the signal.

The Z2 beacon is about 115 miles away, and the chart recording on the right is typical of signals received here in Sunnyvale, CA. Filtered audio is being fed to the chart recorder through a diode. The far left scale is zero volts DC. Far right is 1.2 Volts DC. Each dot represents a "sample" taken about every one second or so. The vertical line (about 1/2 inch from the left hand side) was drawn in by pencil, and represents the approximate noise floor. I determined this boundary by listening to the Z2 signal while the chart recorder was running.

Based on my "ears", dots to the right of the line are Z2 signals of QRK 2 or better strength. To the left of the line are signals of QRK 1 copy, or just plain noise.

It is interesting to observe the fade cycles of the Z2 MedFER signal. For instance, between about 0600 UTC and 0730 UTC, the Z2 signal was quite strong (mostly QSO copy). Then, pretty crummy reception until 1100 UTC, when the signal came up and drifted in and out for many hours. Note that around sunrise (1445 UTC) the Z2 signal strength increased dramatically for almost an hour! This seems to be a typical pattern (pre-dawn enhancement).

Chart recording of signals is a lot of fun, and I would be interested in reports from any readers which are fooling with this technique.



"Yes, yes, I know that, Sidney ... everybody knows that! ... But look: Four wrongs squared, minus two wrongs to the fourth power, divided by this formula, do make a right."